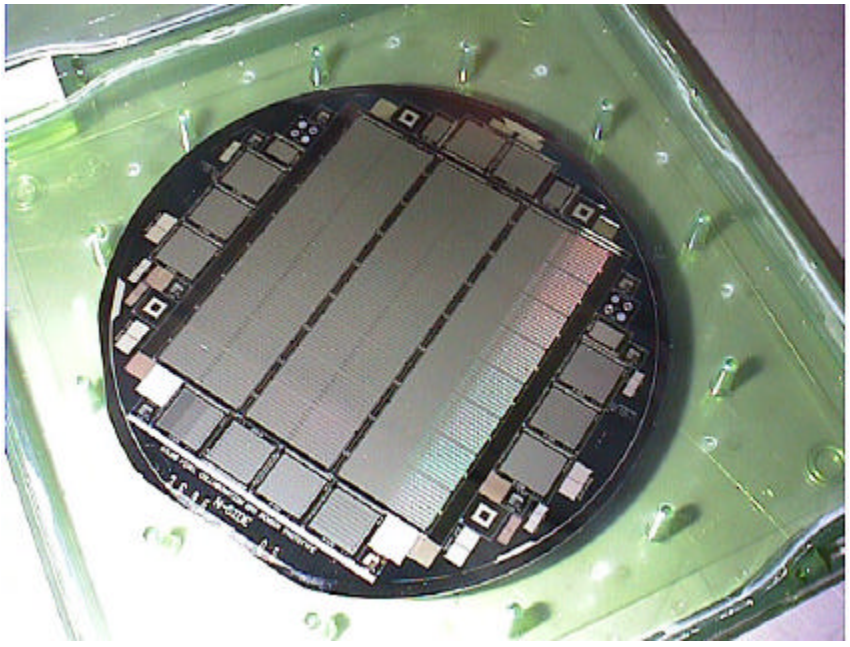
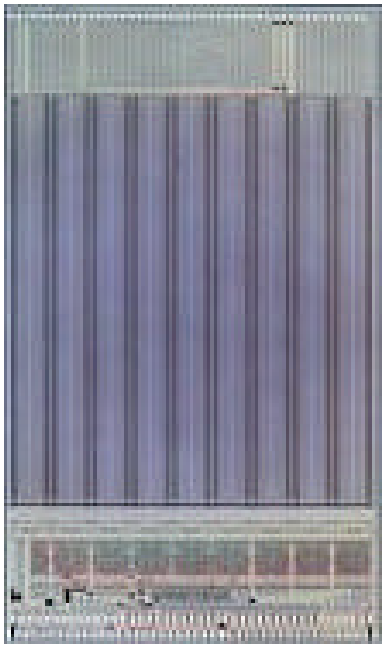
Pixels for CDFII in Run IIb

- Replace Layer00 strips with pixels
  - radiation survivability to 30 Mrad / 30 fb-1 is desirable
  - pattern recognition: 3.3 M channels vs. 14 K channels
  - z resolution of 120 μm gives overlap separation
  - large S:N helps r-ϕ resolution, trigger, etc.
  - keep Layer00 strip option a fallback
- Pixels can be ready for 2004
  - ATLAS style sensors in production
  - FPIX readout chip: “final prototype” works
  - Testbeam demonstrated (Dec 1999 run) w/SVX DAQ
- Overlap with BTeV and D0

ATLAS WAFER



FPIX1 chip



Status

- Sensors
  - Engineering available in Feb to convert to CDF design
  - UNM (Sally Seidel) leads ATLAS sensor development and will do sensor testing and assist on CDF design
  - Work with FNAL rad hard vertex group for placing production order in early FY02
- FPIX readout chip
  - Qualified to 30 Mrad (0.25 μm process!)
  - Pre-FPIX2-Tb ("final prototype" works!)
  - SEU radiation testing this Spring
  - Discussion of final specifications is ongoing
    - Either we will use exactly the FPIX2 chip or have a version that removes some features/complexity that BTeV requires due to being 6mm vs. 13mm from the beam. (For example 2 serializers vs. 4)
    - Work with FNAL rad hard vertex group for finalizing specifications and placing production order in early FY02
  - Fermilab ASIC group will design, produce, and test FPIX2 chips
- Physics Studies
  - Weiming Yao and Petar Maksimovic will work at LBNL: focus on *b*-tagging (for Higgs) with pixels
  - UC Davis (Dave Pellett) has done some initial work
  - Florida (Rick Field) has done occupancy simulations

- Mechanical Engineering (CDF specific)
  - SiDet engineering is available (reorganizing)
  - 3D modeling of the pixel detector has started
  - Engineers at CERN this week meeting with ATLAS pixel project engineers for ideas.
  - Either use ATLAS stave concept OR use a shell structure like Layer00 for support/cooling
- DAQ (CDF specific)
  - FNAL ESE engineering is available in association with the FNAL rad hard vertex group. PC based test stand almost ready for users.
  - CMU (Jim Russ, Manfred Paulini) and JHU (Petar Maksimovic) working on specifications of a pixel-FIB module. Full time engineer beginning in May at FCC. Pixel-FIB also sends data (strip-like) to SVT
  - UC Davis (Dave Pellett) to study signal transmission options
  - Need to start thinking about cable/crate space
- Bump Bonding
  - Work with FNAL rad hard vertex group
  - UC Davis (Dick Lander, Dave Pellett) have capabilities and are bump bonding FPIX2 prototype

Summary

- Pixel project has started (at least no one yet has said “no!”)
- For the next 10 months or so
  - Early FY02 order for sensors and chips!
  - Make progress on mechanical and cooling engineering
  - Make progress on DAQ design
- Excellent assistance from FNAL ASIC, rad hard vertex, ESE groups. D0 also interested.
- Many details to work out and interested people are invited to join this effort

- FY02 is only 8 months away. We will need CDF endorsement of pixels as a desired part of our RunIIb baseline. Work on a full proposal has started: currently documented in RunIIb report and on the web: http://www-rhvd.fnal.gov/wester/